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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/696,789	10/30/2003	Dimitar Filev	FMC 1609 PUS (81044219 2	8115

28395 7590 03/10/2006

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EXAMINER	
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ART UNIT	PAPER NUMBER
2129	

DATE MAILED: 03/10/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	10/696,789	FILEV, DIMITAR
	Examiner	Art Unit
	Benjamin J. Buss	2129

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *30 October 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-25* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-25* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *10/30/2003*.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

This action is responsive to application 10/696,789 filed 10/30/2003. Claims 1-25 are pending and have been examined. An action on the merits of these claims appears below.

Drawings

The drawings have not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is required in correcting any errors of which applicant may become aware in the drawings.

Specification

The specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is required in correcting any errors of which applicant may become aware in the specification.

Claim Objections

Claims 4-5, 7-12, 15-16, 21, & 25 are objected to because of the following informalities:

- Claims 4, 15, & 21:
    - L1: Change "wherein neural network" to -- wherein **the** neural network --.
    - L3-4: Change "first neural layer defined by equation 1 to give a first set of outputs a_i" to -- first neural layer to give a first set of outputs a_i defined by --.
    - L5: Delete the label "1" to the right of the equation.
    - L6-7: Change "second neural layer defined by equation 2 to give outputs O" to -- second neural layer to give output O defined by --.
    - L8: Delete the label "2" to the right of the equation.
- Claim 5, 16, & 25:
    - L2: Delete "equation 4".
    - L3: Delete the label "(4)" to the right of the equation.
- Claims 7-12, last line: Change "thereof" to -- of the above --.

Appropriate corrections are required.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 4, 15, & 21 rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

- Claims 4, 15, & 21 contain an equation that is not found in the specification exactly as claimed. Since small changes in equations can produce large differences in results, the person of ordinary skill in the art would not be enabled in full, clear, concise, and exact terms to make and/or use the invention as claimed. In each of these claims, the equation for $\mathbf{a}_i$ lacks the variable μ found in the most similar equation in the specification. Also, the specification lacks a definition for μ.

Appropriate corrections are required.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims1, 14, &19 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

- Claims 1, 14, & 19 is indefinite because Applicant has not clearly and exactly defined what is being optimized and how it is being optimized. The claim states that "the paint optimization function" is being optimized. If this is so, what is being used to judge the optimization of this function? We know that "the paint optimization function is necessarily a function of the paint layer properties and the paint processing parameters" (¶26). Furthermore, the specification does not clear things up because it allows for optimization of:

- "paint transfer efficiency" and "painting quality control" (¶8)
- "a painting process for applying a paint layer on an article" and "average fluid flow rates for the left, vertical and horizontal bells, and the optimal down drafts in the bell and reciprocator zones" and "final film thickness" (¶9)
- "integrated paint quality control" and "air flow booth control" (¶25)
- "the paint optimization function" (¶26)
- "fluid flows" and "downdrafts" and "values for the paint process parameters" (¶27)
- "adjustment of the paint processing parameters" and "overall paint process performance" and "desired paint layer properties" (¶28)
- "the paint process" and "the optimization function" and "high voltage" and "applicator position parameters" (¶34)
- "transfer efficiency, fluid flows, and the down drafts" (¶42)
- "a painting process" (¶43)

- Claims 1, 14, & 19 are also indefinite because it is not clear if "adjusting the one or more paint processing parameters" constitutes changing the values of inputs (real world or modeled) or changing the values of the weights in the neural network which pertain to those inputs.

Appropriate corrections are required.

Claim Rejections - 35 USC § 101

35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claims 1-25 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

- Claims 1-25: The claimed invention is not a practical application that produces a useful, concrete, and tangible result. The input "paint processing parameters" are openly defined in the specification, including "such as down draft (at the bell zone and reciprocator zone), air temperature, and air humidity, and average fluid flow rate the average film thickness on a particular surface of the vehicle body" (¶9), so the invention is not tied to one functional relationship between input and output. Furthermore, optimizing an optimization

function by adjusting weights is a manipulation of an abstract concept absent any useful, concrete, and tangible result. Therefore, claims 1-25 are non-statutory.

Appropriate corrections are required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-3, 6-8, 11-14, 19-20, & 22-24 rejected under 35 U.S.C. 102(e) as being anticipated by *Shin* (USPN 6,814,756).

Regarding claim 1:

Shin discloses:

- a) defining a functional relationship between the set of paint processing parameters and a paint layer property with a neural network having one or more neural layers to the one or more neural layers comprising a plurality of neural units having a plurality of neural network parameters (C1-11 especially "In this approach 2, the paint film thickness Y of the actual car is calculated by using the neural network, which uses the paint film thickness X of the constituent member calculated by the electrodeposition coating analysis in step 1 as the indispensable input and also uses the distance L, the hole area A, and the inter-member distance H as inputs appropriately. Since the neural network that is suitable for the prediction of the nonlinear phenomenon is employed, the prediction precision of the paint film thickness Y of the actual car can be improved rather than the case where the multiple correlation function f in the approach 1 is employed" C8 L15-26 and "A neural network is utilized as the

correlation predicting expression. FIG. 6 is a view showing a basic configuration of the normal neural network. In the hierarchical neural network that consists of the input layer, the intermediate layers, and the output layer, respective layers are composed of a plurality of elements having the same function. Respective elements are coupled by proper weight coefficients wij" C6 L59-65; Also see Figures 9, 10, & 11),

- b) forming a paint optimization function that measures the efficiency of the painting process, the paint optimization function being a function of the paint layer property (C1-11 especially "In step 3, the paint film thickness Y of the actual car obtained in step 2 is corrected as the case may be. Here, the corrected value is calculated based on the multi-dimensional function, the neural network, or the like, which takes account of differences in voltage pattern, paint characteristic, etc., and then the paint film thickness is corrected by using this corrected value. FIG. 10 is a configurative view showing the neural network for calculating the corrected value. As inputs, there are contained electrodeposition equipment conditions such as maximum voltage (max voltage) of the electrodeposition coating, voltage pattern, operated situation of the equipment, etc., and electrodeposition solution conditions such as paint solution temperature, paint characteristic, etc. In this manner, if the neural network that employs the electrodeposition equipment conditions, the electrodeposition solution characteristic, etc. as the inputs is applied, the optimum corrected value suitable for the actual circumstances can be found and also such neural network can be applied even when the electrodeposition equipment conditions and the electrodeposition solution are changed" C8 L27-47; Also see Figure 10); and
- c) optimizing the paint optimization function by adjusting the one or more paint processing parameters utilizing the functional relationship defined in step a (C1-11 especially "In step 3, the paint film thickness Y of the actual car obtained in step 2 is corrected as the case may be. Here, the corrected value is calculated based on the multi-dimensional function, the neural network, or the like, which takes account of differences

in voltage pattern, paint characteristic, etc., and then the paint film thickness is corrected by using this corrected value. FIG. 10 is a configurative view showing the neural network for calculating the corrected value. As inputs, there are contained electrodeposition equipment conditions such as maximum voltage (max voltage) of the electrodeposition coating, voltage pattern, operated situation of the equipment, etc., and electrodeposition solution conditions such as paint solution temperature, paint characteristic, etc. In this manner, if the neural network that employs the electrodeposition equipment conditions, the electrodeposition solution characteristic, etc. as the inputs is applied, the optimum corrected value suitable for the actual circumstances can be found and also such neural network can be applied even when the electrodeposition equipment conditions and the electrodeposition solution are changed" C8 L27-47; Also see Figure 10).

Regarding claim 2:

Shin discloses wherein the functional relationship is defined by:

- obtaining a plurality of groups of values P_k for the set of paint processing parameters and a value V for the paint layer property for each of the plurality of groups of values P_k wherein k is an index number for each of the paint processing parameters with values from 1 to the number of processing parameters (C1-11 especially "the input is of the mode in which the electrodeposition equipment conditions and the paint characteristic are added to the paint film thickness X of the constituent member, the inter-member distance H, the distance L, and the hole area A" C8 L51-55; Also see Figures 9, 10, & 11; *"P_k" as claimed is simply a label for the inputs to the neural network. Shin uses different labels for the inputs, such as "A_1" and "A_n", but the difference in label nomenclature does not alter the operation of the invention as claimed. Similarly, "V" is simply a label for the desired paint layer property, which Shin refers to a "paint film thickness". These labels correspond to the meaningful values which are essentially the same in Shin as they are in the instant application*); and
- operating on each of the plurality of groups of values P_k for the set of paint processing parameters with the neural network to provide an output O for each of the plurality of groups of values P_k (C1-11 especially "In

step 3, the paint film thickness Y of the actual car obtained in step 2 is corrected as the case may be. Here, the corrected value is calculated based on the multi-dimensional function, the neural network, or the like, which takes account of differences in voltage pattern, paint characteristic, etc., and then the paint film thickness is corrected by using this corrected value. FIG. 10 is a configurative view showing the neural network for calculating the corrected value. As inputs, there are contained electrodeposition equipment conditions such as maximum voltage (max voltage) of the electrodeposition coating, voltage pattern, operated situation of the equipment, etc., and electrodeposition solution conditions such as paint solution temperature, paint characteristic, etc. In this manner, if the neural network that employs the electrodeposition equipment conditions, the electrodeposition solution characteristic, etc. as the inputs is applied, the optimum corrected value suitable for the actual circumstances can be found and also such neural network can be applied even when the electrodeposition equipment conditions and the electrodeposition solution are changed" C8 L27-47; Also see Figures 9, 10, & 11; *"O" as claimed is simply a label for the output of the neural network. Shin uses different labels for the output, such as "paint film thickness of actual car" or "corrected value of paint film thickness" or "paint film thickness Y", but the difference in label nomenclature does not alter the operation of the invention as claimed. These labels correspond to the meaningful values which are essentially the same in Shin as they are in the instant application*); and

- adjusting the plurality of neural network parameters to minimize the differences between the output O and the value V for each of the one or more groups of values for a set of paint processing parameters to give a plurality of adjusted neural network parameters (C1-11 especially "In order to achieve the improvement of the precision of the estimated results by the neural network, the weight coefficient wij and the threshold value θj must be adjusted appropriately. This adjustment (called also the "learning") is carried out by the approach that is called the Back-Propagation method. This method prepares the teacher's data previously, then proceeds the learning such that the result coincides with the teacher's data, and then decides the weight coefficient wij

and the threshold value θj. Both initial values of the weight coefficient wij and the threshold value θj are given by the random number. The input data are input into the input layer element of the neural network, and then an error E expressed by following Expression 4 is calculated by comparing the output result from the output layer element with the value of the teacher's data. Where Yk is the output value of the output element of the neural network, Dk is a desired output value, and n is the number of the teacher's data" C7 L19-35).

Regarding claim 3:

Shin discloses:

- wherein the step of operating on each of the plurality of groups of values P_k and the step of adjusting the plurality of neural network parameters is performed on a computer (C1-11 especially "In order to overcome such subject, a first aspect of the present invention provides a paint film thickness predicting method for an actual car, which predicts a paint film thickness of an object car in an actual car state, an electrodeposition coating being applied to the object car by using an electrodeposition coating line, having a calculating an analyzed value of the paint film thickness of a constituent member constituting a part of the object car by executing electrodeposition coating analysis by using a computer, the constituent member being employed as an analyzed object in the electrodeposition coating analysis, and a predicting the paint film thickness of the object car in the actual car state from the analyzed value of the paint film thickness by the computer based on a previously-prepared correlation predicting expression, wherein the correlation predicting expression stipulates a correlation between the paint film thickness of a mass-produced car, to which the electrodeposition coating has already been applied in an electrodeposition coating line by which the electrodeposition coating is applied to the object car, in the actual car state and an analyzed value of the paint film thickness of the constituent member, which is obtained by the electrodeposition coating analysis that is applied to

the constituent member constituting a part of the mass-produced car as the analyzed object. At that time, it is preferable that the constituent member constituting a part of the mass-produced car is same as the constituent member constituting apart of the object car, improvement in the prediction precision of the paint film thickness can be achieved. Here, in the above calculating, a function using at least the analyzed value of the paint film thickness of the constituent member as an input variable may be employed as the correlation predicting expression. Also, in the predicting, a neural network using at least the analyzed value of the paint film thickness of the constituent member as an input variable may be employed as the correlation predicting expression" C2 L4-39).

Regarding claim 6:

Shin discloses:

- wherein the paint layer property is the average thickness of the paint layer within a region of the article (C1-11 especially "FIG. 9 is a configurative view showing a neural network for predicting the paint film thickness for the actual car" C7 L63-64 and "the paint film thickness Y of the actual car is calculated by using the neural network" C8 L15-16; Also see Figures 9, 10, & 11).

Regarding claim 7:

Shin discloses:

- wherein one or more paint processing parameters are selected from the group consisting of applicator parameters (C1-11 especially "maximum voltage" C36-39 and "voltage pattern" C36-39 and "operated situation of the equipment" C36-39), environmental parameters, applicator position parameters (C1-11 especially "position of the electrodes" C9 L29), paint material parameters (C1-11 especially "flow of the paint" C9 L28-29 and "paint film thickness X" C8 L54 and

"`paint solution temperature`" C8 L398-40 and "`paint characteristic`" C8 L39-40), and combinations of the above.

Regarding claim 8:

Shin discloses:

- wherein the applicator parameters are selected from the group consisting of fluid flow rates (C1-11 especially "`flow of the paint`" C9 L28-29, shaping air flow rates, bell speeds, high voltage setting (C1-11 especially "`maximum voltage`" C36-39), and combinations of the above.

Regarding claim 11:

Shin discloses:

- wherein the paint material properties are selected from the group consisting of paint viscosity (C1-11 especially "`paint film thickness X`" C8 L54 and "`film thickness resistance of the paint`" C5 L12-13; *Viscosity is the thickness of a fluid, to the thickness of the paint is measured in terms of how viscous it is. Viscosity is also defined as a measure of how resistance of a material to flow*), paint temperature (C1-11 especially "`paint solution temperature`" C8 L398-40), paint resistivity (C1-11 especially "`film thickness resistance of the paint`" C5 L12-13), and combinations of the above.

Regarding claim 12:

Shin discloses:

- wherein one or more paint processing parameters are selected from the group consisting of average fluid flow rate (C1-11 especially "`flow of the paint`" C9 L28-29), downdrafts at the bell zones, downdrafts at the reciprocator zones, air temperature, air humidity, and combinations of the above.

Regarding claim 13:

Shin discloses:

- wherein the step of optimizing the paint optimization function is performed on a computer (C1-11 especially "In order to overcome such subject, a first aspect of the present invention provides a paint film thickness predicting method for an actual car, which predicts a paint film thickness of an object car in an actual car state, an electrodeposition coating being applied to the object car by using an electrodeposition coating line, having a calculating an analyzed value of the paint film thickness of a constituent member constituting a part of the object car by executing electrodeposition coating analysis by using a computer, the constituent member being employed as an analyzed object in the electrodeposition coating analysis, and a predicting the paint film thickness of the object car in the actual car state from the analyzed value of the paint film thickness by the computer based on a previously-prepared correlation predicting expression, wherein the correlation predicting expression stipulates a correlation between the paint film thickness of a mass-produced car, to which the electrodeposition coating has already been applied in an electrodeposition coating line by which the electrodeposition coating is applied to the object car, in the actual car state and an analyzed value of the paint film thickness of the constituent member, which is obtained by the electrodeposition coating analysis that is applied to the constituent member constituting a part of the mass-produced car as the analyzed object" C2 L4-27 and "This computer 10 executes the electrodeposition coating analysis of a constituent member (single body of the member or assembled body of plural members) constituting a part of the actual car as the analyzed object (object car) and predicts the paint film thickness at the actual car level on the electrodeposition coating line of this object car based on the analyzed result (analyzed value of the paint film thickness)" C4 L19-26).

Regarding claim 14:

Shin discloses:

- a) obtaining a plurality of groups of values P_k for the set of paint processing parameters and a value V for the paint layer property for each of the plurality of groups of values P_k wherein k is an index number for each of the paint processing parameters with values from 1 to the number of processing parameters (C1-11 especially "the input is of the mode in which the electrodeposition equipment conditions and the paint characteristic are added to the paint film thickness X of the constituent member, the inter-member distance H, the distance L, and the hole area A" C8 L51-55; Also see Figures 9, 10, & 11; *"P_k" as claimed is simply a label for the inputs to the neural network. Shin uses different labels for the inputs, such as "A_1" and "A_n", but the difference in label nomenclature does not alter the operation of the invention as claimed. Similarly, "V" is simply a label for the desired paint layer property, which Shin refers to a "paint film thickness". These labels correspond to the meaningful values which are essentially the same in Shin as they are in the instant application*);
- b) defining a functional relationship between the set of paint processing parameters and a paint layer property by operating on each of the plurality of groups of values P_k for the set of paint processing parameters with a neural network having one or more neural layers to provide an output O for each of the plurality of groups of values P_k, the one or more neural layers comprising a plurality of neural units having a plurality of neural network parameters (C1-11 especially "In this approach 2, the paint film thickness Y of the actual car is calculated by using the neural network, which uses the paint film thickness X of the constituent member calculated by the electrodeposition coating analysis in step 1 as the indispensable input and also uses the distance L, the hole area A, and the inter-member distance H as inputs appropriately. Since the neural network that is suitable for the prediction of the nonlinear phenomenon is employed, the prediction precision of the paint film thickness Y of the actual car can be improved rather than the case where the multiple correlation function f in the approach 1 is employed. In step 3, the paint film thickness Y of the actual car obtained in step 2 is corrected as the case may be. Here, the corrected value is calculated based on the multi-dimensional function, the neural network, or the like, which takes account of differences in voltage pattern, paint characteristic, etc., and then the paint film thickness is corrected by using this corrected value. FIG. 10 is

a configurative view showing the neural network for calculating the corrected value. As inputs, there are contained electrodeposition equipment conditions such as maximum voltage (max voltage) of the electrodeposition coating, voltage pattern, operated situation of the equipment, etc., and electrodeposition solution conditions such as paint solution temperature, paint characteristic, etc. In this manner, if the neural network that employs the electrodeposition equipment conditions, the electrodeposition solution characteristic, etc. as the inputs is applied, the optimum corrected value suitable for the actual circumstances can be found and also such neural network can be applied even when the electrodeposition equipment conditions and the electrodeposition solution are changed" C8 L15-47and "A neural network is utilized as the correlation predicting expression. FIG. 6 is a view showing a basic configuration of the normal neural network. In the hierarchical neural network that consists of the input layer, the intermediate layers, and the output layer, respective layers are composed of a plurality of elements having the same function. Respective elements are coupled by proper weight coefficients wij" C6 L59-65; Also see Figures 9, 10, & 11; *"O" as claimed is simply a label for the output of the neural network. Shin uses different labels for the output, such as "paint film thickness of actual car" or "corrected value of paint film thickness" or "paint film thickness Y", but the difference in label nomenclature does not alter the operation of the invention as claimed. These labels correspond to the meaningful values which are essentially the same in Shin as they are in the instant application*);

- c) adjusting the plurality of neural network parameters to minimize the differences between the output O and the value V for each of the one or more groups of values for a set of paint processing parameters to give a plurality of adjusted neural network parameters (C1-11 especially "In order to achieve the improvement of the precision of the estimated results by the neural network, the weight coefficient wij and the threshold value θj must be adjusted appropriately. This adjustment (called also the "learning") is carried out by the approach that is called the Back-Propagation method. This method prepares the teacher's data previously, then proceeds the learning such that the result

coincides with the teacher's data, and then decides the weight coefficient wij and the threshold value θj. Both initial values of the weight coefficient wij and the threshold value θj are given by the random number. The input data are input into the input layer element of the neural network, and then an error E expressed by following Expression 4 is calculated by comparing the output result from the output layer element with the value of the teacher's data. Where Yk is the output value of the output element of the neural network, Dk is a desired output value, and n is the number of the teacher's data" C7 L19-35);

- d) forming a paint optimization function that measures the efficiency of the painting process, the paint optimization function being a function of the paint layer property (C1-11 especially "In step 3, the paint film thickness Y of the actual car obtained in step 2 is corrected as the case may be. Here, the corrected value is calculated based on the multi-dimensional function, the neural network, or the like, which takes account of differences in voltage pattern, paint characteristic, etc., and then the paint film thickness is corrected by using this corrected value. FIG. 10 is a configurative view showing the neural network for calculating the corrected value. As inputs, there are contained electrodeposition equipment conditions such as maximum voltage (max voltage) of the electrodeposition coating, voltage pattern, operated situation of the equipment, etc., and electrodeposition solution conditions such as paint solution temperature, paint characteristic, etc. In this manner, if the neural network that employs the electrodeposition equipment conditions, the electrodeposition solution characteristic, etc. as the inputs is applied, the optimum corrected value suitable for the actual circumstances can be found and also such neural network can be applied even when the electrodeposition equipment conditions and the electrodeposition solution are changed" C8 L27-47; Also see Figure 10); and
- e) optimizing the paint optimization function by adjusting the one or more paint processing parameters utilizing the functional relationship defined in step d (C1-11 especially "In step 3, the paint film thickness Y of the actual car obtained in step 2 is corrected as the case may

be. Here, the corrected value is calculated based on the multi-dimensional function, the neural network, or the like, which takes account of differences in voltage pattern, paint characteristic, etc., and then the paint film thickness is corrected by using this corrected value. FIG. 10 is a configurative view showing the neural network for calculating the corrected value. As inputs, there are contained electrodeposition equipment conditions such as maximum voltage (max voltage) of the electrodeposition coating, voltage pattern, operated situation of the equipment, etc., and electrodeposition solution conditions such as paint solution temperature, paint characteristic, etc. In this manner, if the neural network that employs the electrodeposition equipment conditions, the electrodeposition solution characteristic, etc. as the inputs is applied, the optimum corrected value suitable for the actual circumstances can be found and also such neural network can be applied even when the electrodeposition equipment conditions and the electrodeposition solution are changed" C8 L27-47; Also see Figure 10).

Regarding claims 19-20:

Claims 19 & 20 are rejected on the same grounds as claim 14 above.

Regarding claim 22:

Shin discloses:

- wherein the paint layer property is the average thickness of the paint layer within a region of the article (C1-11 especially "FIG. 9 is a configurative view showing a neural network for predicting the paint film thickness for the actual car" C7 L63-64 and "the paint film thickness Y of the actual car is calculated by using the neural network" C8 L15-16; Also see Figures 9, 10, & 11).

Regarding claim 23:

Shin discloses:

- wherein one or more paint processing parameters are selected from the group consisting of applicator parameters (C1-11 especially "`maximum voltage`" C36-39 and "`voltage pattern`" C36-39 and "`operated situation of the equipment`" C36-39), environmental parameters, applicator position parameters (C1-11 especially "`position of the electrodes`" C9 L29), paint material parameters (C1-11 especially "`flow of the paint`" C9 L28-29 and "`paint film thickness X`" C8 L54 and "`paint solution temperature`" C8 L398-40 and "`paint characteristic`" C8 L39-40), and combinations of the above.

Regarding claim 24:

Shin discloses:

- wherein one or more paint processing parameters are selected from the group consisting of average fluid flow rate (C1-11 especially "`flow of the paint`" C9 L28-29), downdrafts at the bell zones, downdrafts at the reciprocator zones, air temperature, air humidity, and combinations of the above.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 9 & 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Shin* (USPN 6,814,756) as applied to claims 1-3, 6-8, 11-14, 19-20, & 22-24 above, and further in view of *Rupieper* (US Patent Application Publication No. 2002/0122033).

Regarding claim 9:

Shin fails to explicitly disclose:

- wherein the environmental parameters are selected from the group consisting of air downdrafts in the reciprocator zones, air downdrafts in the bell zone, air temperature, air humidity, and combinations of the above.

Rupieper teaches:

- wherein the environmental parameters are selected from the group consisting of air downdrafts in the reciprocator zones, air downdrafts in the bell zone, air temperature, air humidity, and combinations of the above (Pages1-6 especially "`Coating parameters which may have a perceptible effect on the optical coating result are known to the skilled person. Examples of application parameters are the number of spray passes for the application of a coating layer, flow rate of the coating agent, distance and angle between the application device and the surface to be coated, type of atomiser, air temperature, object temperature, humidity, air downdraft, speed of movement of the application device (track speed), line speed; in the case of pneumatic application, fan air and atomising air; in the case of electrostatically supported application, guiding air, bell speed, and voltage. Examples of drying and curing parameters are type of drying and curing such as curing with high-energy radiation, for example, UV radiation and/or thermal curing; in the case of different successive curing steps, the sequence thereof, heating-up rate, object temperature, oven temperature, evaporation time, stoving time, humidity; in the case of thermal curing, effect of heat with convection and/or infrared radiation`" ¶19).

Motivation:

Rupieper and *Shin* are from the same field of endeavor, analysis and application of a coating upon an article. At the time of the invention, it would have been obvious to the person or ordinary skill in the art to combine the coating process taught by *Rupieper* which uses application parameters such as air temperature, humidity, air downdraft, guiding air, and bell speed in the coating of an object with the invention of *Shin* which uses a neural network to relate input parameters to the thickness of the paint coating applied to a vehicle. Motivation for doing so would have been because the coating parameters of *Rupieper* "`have a perceptible effect on the optical coating result`" (*Rupieper* ¶19) and

"in order to determine the layer thickness-dependent optical data" (*Rupieper* ¶14). Therefore, it would have been obvious to the person of ordinary skill in the art to use the parameters taught by *Rupieper* such as air temperature, humidity, air downdraft, guiding air, and bell speed as input parameters to the neural network of *Shin* for the benefit of considering those parameters which have a perceptible effect on the optical coating result in determining the layer thickness-dependent optical data.

Regarding claim 10:

Shin fails to explicitly disclose:

- wherein the applicator position parameters are selected from the group consisting of target distance, angle to target, bell position, oscillation speed, oscillation stroke, bell separation, and combinations of the above.

Rupieper teaches:

- wherein the applicator position parameters are selected from the group consisting of target distance, angle to target, bell position, oscillation speed, oscillation stroke, bell separation, and combinations of the above (Pages1-6 especially "Coating parameters which may have a perceptible effect on the optical coating result are known to the skilled person. Examples of application parameters are the number of spray passes for the application of a coating layer, flow rate of the coating agent, distance and angle between the application device and the surface to be coated, type of atomiser, air temperature, object temperature, humidity, air downdraft, speed of movement of the application device (track speed), line speed; in the case of pneumatic application, fan air and atomising air; in the case of electrostatically supported application, guiding air, bell speed, and voltage. Examples of drying and curing parameters are type of drying and curing such as curing with high-energy radiation, for example, UV radiation and/or thermal curing; in the case of different successive curing steps, the sequence thereof, heating-up rate, object temperature, oven temperature, evaporation time, stoving time, humidity; in the case of thermal curing, effect of heat with convection and/or infrared radiation" ¶19).

<u>Motivation</u>:

Rupieper and *Shin* are from the same field of endeavor, analysis and application of a coating upon an article. At the time of the invention, it would have been obvious to the person or ordinary skill in the art to combine the coating process taught by *Rupieper* which uses application parameters such as distance and angle between the application device and the surface to be coated and bell speed in the coating of an object with the invention of *Shin* which uses a neural network to relate input parameters to the thickness of the paint coating applied to a vehicle. Motivation for doing so would have been because the coating parameters of *Rupieper* "have a perceptible effect on the optical coating result" (*Rupieper* ¶19) and "in order to determine the layer thickness-dependent optical data" (*Rupieper* ¶14). Therefore, it would have been obvious to the person of ordinary skill in the art to use the parameters taught by *Rupieper* such as distance and angle between the application device and the surface to be coated and bell speed as input parameters to the neural network of *Shin* for the benefit of considering those parameters which have a perceptible effect on the optical coating result in determining the layer thickness-dependent optical data.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

- *McClanahan* (USPN 6,714,924 & USPN 6,804,390) discloses a neural network for color matching in paint recipes.
- *Filev* ("Applied Intelligent Control – Control of Automotive Paint Process") is by Applicant and states Applicant has demonstrated the benefits of using RBIC Intelligent Control Algorithm versus the conventional indirect adaptive control and neural network based adaptive control for controlling a paint process.
- *Kumar* ("Feasibility of Using Neural Networks and Genetic Algorithms To Predict and Optimize Coated Paper and Board Brightness") discloses using neural networks in controlling the coating of paper products.
- *Guessasma* ("On the Implementation of Neural Network Concept to Optimize Thermal Spray Deposition Process" – Abstract) is directed to using artificial neural networks to optimize up to fifty processing parameters in the plasma spray deposition process.

Correspondence Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Benjamin J. Buss whose telephone number is 571-272-5831. The examiner can normally be reached on M-F 9AM-5PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Vincent can be reached on 571-272-3080. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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3/6/06
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